

REMARKS

Applicants thank Examiner Rábago for discussing the present application with Applicants' representative, Daniel R. Evans, on February 10, 2006. Applicants also thank Examiner Rábago for discussing the present application for a second time with Applicants' representative, Daniel R. Evans, and Ms. Junko Itoh, a Mitsubishi Chemical Corporation representative on February 24, 2006. The content of both discussions is reflected in the amendments to the claims and the following remarks.

The rejection of Claims 1-3, 5, and 7-13 under 35 U.S.C. § 102(e) [sic] over the disclosure of JP 2002-47314 (JP '314) is respectfully traversed.

It is noted that US 6,635,733 (US '733) is related to JP '314. The following discussion contains citations to US '733.

US '733 is directed to an elastomeric polypropylene having a melting point that ranges from 50–160°C (see US '733 at col. 2, lines 44-45; col. 4, lines 11-16; and col. 14, lines 26-17). Additionally, it is noted that the propylene polymers exemplified in US '733 have melting points of 141°C (Ex. 1) and 107°C (Ex. 2).

This is unlike the presently claimed propylene-based polymer of Claim 1, which has no melting point. It is respectfully requested that the Examiner acknowledge this difference and withdraw this rejection.

As background information, the Examiner's attention is directed to the disclosure of Collette et al. ("Collette"),¹ which discloses that the melting point is a function of the lamellar thickness, which is then a function of the length of isotactic sequence. In other words, the melting point is a function of the length of isotactic sequence.

¹ Cited in the concurrently filed **Information Disclosure Statement** as reference AO: Collette et al., *Macromol.*, 22, 3858 (1989).

The polymer in Example 1 of US '733 has a melting point of 141°C. The relationship of the melting point versus lamellar thickness is represented in Fig. 8 in the right column of p. 3863 of Collette. Based on this information it is seen that the lamellar thickness of the polymer with a melting point of 141°C is about 12 nm. In addition, in the second paragraph of the right column of p. 3865 of Collette, it is disclosed that the minimum lamellar thickness observed with TEM is 3 nm, which corresponds to an isotactic sequence consisting of about 14 propylene monomers.

Accordingly, the polypropylene in Example 1 of US '733 having a lamellar thickness of about 12 nm has a length of isotactic sequence consisting of about 56 propylene monomers.

On the other hand, the minimum crystalline lamellar thickness observed with TEM is 3 nm. Since no melting point is observed by DSC for the polypropylene of the present application, the length of isotactic sequence is less than 14 in terms of propylene monomer unit.

As has been explained heretofore, the polypropylene of the present invention has a different structure from that of the polypropylene of US '733.

Because the polymer of the presently claimed invention and the polymer of US '733 are obtained by different catalysts, the polypropylene of the present invention cannot be obtained even by using the catalyst of US '733.

In this regard, the Office has taken the position that US '733 also uses a metallocene catalyst as the present invention (see October 3, 2005 Office Action at page 3, line 1). It is noted that the polymer of the present invention is obtained using a metallocene catalyst having C_1 symmetry, while the polymer disclosed in US '733 is obtained by employing a catalyst having C_2 symmetry. In other words, since the type of metallocene catalyst is different, the resulting polymer is also different.

The rejection of Claims 1-6 and 9-13 under 35 U.S.C. § 102(b) over the disclosure of WO 99/67303 (WO '303) is respectfully traversed.

It is noted that US 6,906,155 (US '155) is related to WO '303. US '155 is based on U.S. application 09/719,552 (US '552). Since WO '303 was published in Japanese, the following discussion contains citations to US '155.

The Office has taken the position that the polymer exemplified in Comparative Example 2 (see Table III-1 at cols. 125-126) falls within the scope of Claim 1 (see October 3, 2005 Office Action at page 3, lines 16-18).² The Office has also indicated that the molecular weight of the polymer of Comparative Example 2 is not disclosed, but that "this property would appear to be inherent because applicants have claimed virtually the entire range of conventional Mw values for polypropylene polymers" (see October 3, 2005 Office Action at page 3, lines 18-20).

While it may be true that US '155 does not explicitly disclose the molecular weight of the disclosed polymer, US '155 discloses the intrinsic viscosity of the polymer in decaline solution at 135°. From the intrinsic viscosity, one can calculate that the polymer exemplified in Comparative Example 2 has a molecular weight of 2,635,729. Because the molecular weight falls outside the claimed molecular weight range, as recited in Claim 1, the exemplified polymer at issue does not anticipate the polymer claimed in Claim 1.

In this regard, Applicants note that from the value of the intrinsic viscosity, $[\eta]$, one can calculate the value of the molecular weight if the solvent and the measuring temperature adopted for the measurement of intrinsic viscosity are known.

² The other exemplified polymers disclosed in Table III-1 have a % 2,1-insertion value of 0 and a % 1,3-insertion value of 0, and thus, do not fall within the scope of Claim 1.

US '155 discloses that the polymer of Comparative Example 2 in Table III-1 has an $[\eta]$ -value of 13.7. The molecular weight of this polymer can be calculated by employing the Mark-Houwink-Sakurada equation,³ which is provided in eqn. (1):

$$[\eta] = KM^a \quad (1)$$

where $[\eta]$ is the intrinsic viscosity, K and a are constants, and M is the molecular weight of the polymer. Rearrangement of eqn. 1, in order to solve for M, gives the following expression shown in eqn. 2:

$$M = \sqrt[a]{\frac{[\eta]}{K}} \quad (2).$$

Thus, if one knows the solvent and the temperature employed for the measurement of the $[\eta]$, then one can calculate the molecular weight of the polymer by employing eqn. 2. Because of a printing error at the time of issue, determination of solvent and measuring temperature employed for Comparative Example 2 of US '155 cannot be directly ascertained from specification text of the issued patent. In order to determine the solvent and measurement temperature one must look to the original specification text of US '552 (the application of US '155) at pages 296-298 (please see Attachment 1), or alternatively the disclosure of PCT/JP99/03405) as evidenced by pages 196 and 236 of WO '303 and English translations thereof (please see Attachment 2). At the bottom of page 296 of the specification of US '552 it is disclosed that "[m]easurement [of the intrinsic viscosity] was made by the method described in the first invention." The Examiner's attention is also directed to the disclosure of US '155 at column 101, under the sub-heading "First Invention" at lines 8-10, which reads as follows (Emphasis added.):

³ An **Information Disclosure Statement** is concurrently filed that cites (Reference AV) a portion from the 3d Edition of the Polymer Handbook entitled "Viscosity-Molecular Weight Relationships and Unperturbed Dimensions of Linear Chain Molecules." Eqn. 1 is disclosed in page VII/2 of this reference, while values of K and a are disclosed on page VII/7 of this reference.

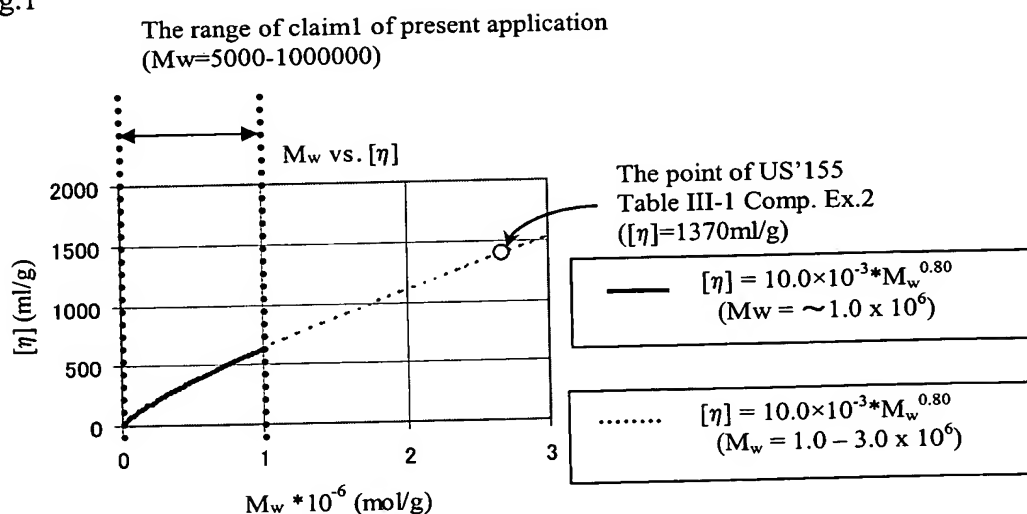
(1) Intrinsic Viscosity $[\eta]$

An automatic viscometer model VMR-053 available from RIGOSHA (KK) was used in a decalone solvent at 135°C.

Accordingly, the value of $[\eta]$ of the polymer disclosed as Comparative Example 2 in Table III-1 was obtained in decalone at 135°C. The Examiner's attention is now directed to page VII/7 of the "Polymer Handbook," which discloses values of "K" and "a" for isotactic polypropylene determined in decalone at 135°C. Substitution of the values of $[\eta]$ (1370 ml/g), K (10×10^{-3} ml/g), and a (0.80) into eqn. 2 provides a calculated molecular weight of 2,635,729.

Applicants note that this value falls outside the molecular weight range of from 5000 to 1,000,000 defined by Claim 1 of the present invention. This difference is clearly illustrated in the following Figure.

Fig.1



During the February 24, 2006 discussion, Examiner Rábago expressed concern about the uncertainty associated with the calculated value. For example, if the calculated value of the molecular weight has an associated error of $\pm 5\%$, then there is no issue. However, if the calculated value of the molecular weight has an associated error of $\pm 50\%$, then there could

be some overlap between the claimed range and the calculated value of the molecular weight of the polymer identified in Comparative Example 2 of US '155 (see Table III-1).

In this regard, the Examiner's attention is directed page VII/3 of the "Polymer Handbook" which discloses that calculated molecular weights can have errors that range from 6 to 70%. However, the Examiner is reminded that the "Polymer Handbook" at page VII/3 discloses that error depends on whether or not the "M" used in the calculation formula is M_n (number-average molecular weight) or M_w (weight-average molecular weight). The error of "70%" corresponds to the case where M_n is used as M, and the error of "6%" corresponds to that in case where M_w is used as M. The "Polymer Handbook" also discloses that the small error in conversion of M_w and the intrinsic viscosity $[\eta]$ as "[h]ence, the error M_w amounts to only 6% ($M'_w = 0.94 M_w$), which will be negligible for more practical purpose" (see page VII/3, left-hand column, lines 14-15, Emphasis added.).

Applicants use M_w (weight-average molecular weight), as defined in Claim 1 of the present application, and M_w is also defined in Comparative Example 2 in Table-III in US '155. Accordingly, as is clear from the "Polymer Handbook," the calculation value with using M_w by the applicants is reliable.

Because the calculated value of the molecular weight of the polymer identified as Comparative Example 2 in Table III-1 of US '155 is reliable, then there can be no overlap between the molecular weight values. Because there is no overlap between the value of the molecular weight and the claimed molecular weight, there not only can be no issue of anticipation, there can be no issue of obviousness. It is respectfully requested that the Examiner acknowledge the same and withdraw this rejection.

In view of the amendments to the claims and the preceding remarks and supporting information, it is believed that the present application is now in a condition for allowance.

Application No. 10/650,676
Reply to Office Action of October 3, 2005

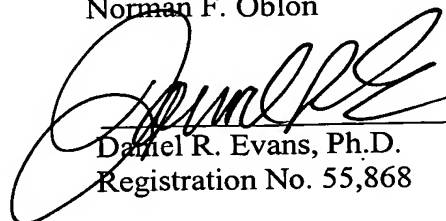
Should the Examiner deem that a personal or telephonic interview would be helpful in advancing this application toward allowance, he is encouraged to contact Applicants' undersigned representative at the below-listed telephone number.

Applicants concurrently file an Information Disclosure Statement citing references that are cited in the specification text, as well as references and Office Actions cited in copending applications that are considered to be related to the present application: (1) U.S. 10/284,241 (2: December 4, 2003 Office Action ("OA") and May 26, 2004 OA); (2) 10/986,341 (March 14, 2006 OA); and (3) 10/972,914 (2: October 12, 2005 OA and March 22, 2006 OA). Applicants kindly request that the Examiner acknowledge consideration of these references in the following Office Communication.

Applicants note that shortened statutory period for reply to the Office Action dated October 3, 2005 was on January 3, 2006. Accordingly, Applicants concurrently file a request for a three-month extension of time under 37 CFR § 1.136, with the appropriate fee under 37 CFR § 1.17. Should there exist a variance between that which is paid and owed, the Office is authorized to charge deposit account number 15-0030, in order to maintain pendency of the above-identified application.

Respectfully submitted,

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Response for US 10/650,676

Filed April 3, 2006

Attachment 1
3 pages
US 09/719,552

notches being formed

Table II-4

Item	Example 1	Example 5	Example 6	Example 7	Example 8	Example 9
Nucleating agent	-	GELOL MD	GELOL MD	GELOL MD	GELOL MD	NA-11
Nucleating agent level ppm	-	1000	2000	5000	10000	2000
T _m °C	nd	nd	64	65	64	64
T _c °C	nd	nd	nd	nd	nd	nd
Tensile modulus Mpa	30	32	35	41	42	32
Internal haze %	4	5	5	5	4	5
% Elasticity recovery %	69	70	72	75	76	76
Izod impact strength KJ/m ²	2.8	3.2	2.9	5.0	2.9	7.1

(NOTE) Izod impact strength: Determined at -5°C with notches being formed

Table II-5

Item	Example 10	Example 11	Example 12	Comparative Example 1	Comparative Example 3	Comparative Example 4
Tensile modulus Mpa	190	230	560	330	1500	240
Internal haze %	33	43	54	60	44	71
% Elasticity recovery %	20	1	No recovery	No recovery	No recovery	No recovery
Izod impact strength KJ/m ²	2.5	2.4	1.9	2.1	1.9	1.6

(NOTE) Izod impact strength: Determined at -5°C with notches being formed

[Third invention]

A method for evaluating the resin characteristics and the physical characteristics of a polymer according to the invention are described below.

(1) Intrinsic viscosity $[\eta]$

Measurement was made by the method described in the first

invention.

(2) % Pentad and % abnormal insertion

Measurement was made by the method described in the second invention.

(3) Comonomer unit content (% by mole) in copolymer

Measurement was made by the method described in the second invention.

(4) Molecular weight distribution (Mw/Mn)

Measurement was made by the method described in the first invention.

(5) DSC analysis

Measurement was made by the method described in the second invention.

(6) Temperature-raising fractional chromatography

Measurement was made by the method described in the first invention.

(7) Amount of components dissolved out into hexane (H25)

Measurement was made by the method described in the second invention.

(8) Boiling diethylether extract

Measurement was made by the method described in the first invention.

(9) Frequency distribution determination of melt viscoelasticity

A value of (η^*) (Pa·s) is obtained using a rotary

rheometer (ARES) manufactured by RHEOMETRIX together with a parallel plate (25 mm in diameter, imm in gap) at the temperature of 230°C and at the initial strain of 20 % or less.

(10) Tensile modulus

Measurement was made by the method described in the second invention.

[Example III-1] Propylene homopolymer

(1) Catalyst preparation

(1,2'-dimethylsilylene)(2,1'-dimethylsilylene)-bis(3-n-butylindenyl)zirconium dichloride

A Schlenk's bottle receives 0.83 g (2.4 mmol) of (1,2'-dimethylsilylene)(2,1'-dimethylsilylene)-bis(indene) and 50 mL of ether. The mixture is cooled to -78°C and combined with 3.1 mL (5.0 mmol) of n-BuLi (1.6 M solution in hexane) and then stirred at room temperature for 12 hours. The solvent is distilled off to obtain a solid which is washed with 20 mL of hexane to obtain 1.1 g (2.3 mmol) of a lithium salt as an ether adduct. This lithium salt is dissolved in 50 mL of THF and cooled to -78°C. 0.57 mL (5.3 mmol) of n-butyl bromide is added dropwise slowly and the mixture is stirred at room temperature for 12 hours. After distilling the solvent off followed by extraction with 50 mL of hexane, followed by removing the solvent, 0.81 g (1.77 mmol) of (1,2'-dimethylsilylene)(2,1'-dimethylsilylene)-bis(3-n-butylindene) (yield: 74 %).

10～1,000gとなるように条件を調整することが好ましい。

Response for US 10/650,676
filed April 13, 2006

以下に、実施例に基づいて本発明をさらに具体的に説明するが、本発明はこれらの実施例に限定されるものではない。

〔第一発明〕

プロピレン系重合体の評価方法及びフィルムの評価方法について説明する。

(ア) 樹脂特性の評価方法

(1) 極限粘度 $[\eta]$

(株) 離合社のVMR-053型自動粘度計を用い、デカリン溶媒中135℃において測定した。

(2) 分子量分布 (M_w/M_n)

明細書本文中に記載した方法に従って測定した。

(3) アイソタクチックペンタッド分率および異常挿入分率の測定

明細書本文中に記載した方法に従って測定した。

(4) 融点 (T_m) 及び結晶化温度 (T_c) の測定

示差走査型熱量計 (パーキン・エルマー社製, DSC-7) を用い、あらかじめ試料10mgを窒素雰囲気下、230℃で3分間熔融した後、10℃/分で0℃まで降温する。このときに得られた結晶化発熱カーブの最大ピークのピークトップを結晶化温度とした。また、さらに0℃で3分間保持した後、10℃/分で昇温させることにより得られた融解吸熱カーブの最大ピークのピークトップを融点とした。

(5) 沸騰エーテル抽出量

ソックスレー抽出器を用い、以下の条件で測定した。

抽出試料: 5～6g

It is preferred that conditions are controlled in such that it becomes 10 to 1,000 g.

The present invention is further specifically described based on the following examples, which are not intended to restrict the invention.

[First Invention]

A method for evaluating a propylene-based polymer and a method for evaluating a film are described below.

(A) Method for Evaluating Resin Characteristics

(1) Intrinsic Viscosity $[\eta]$

Measurement was made by means of an automatic viscometer model VMR-053 available from RIGOSHA (KK) in a decalin solvent at 135°C.

(2) Molecular Weight Distribution (Mw/Mn)

Measurement was made in accordance with the method described in the description in the specification.

(3) Measurement of % Isotactic Pentad and % Abnormal Insertion

Measurement was made in accordance with the method described in the description in the specification.

(4) Measurement of Melting Point (T_m) and Crystallization Temperature (T_c)

Using a differential scanning calorimeter (Perkin Elmer, DSC-7), 10 mg of a sample was fused for 3 minutes at 230°C under a nitrogen atmosphere and then the temperature was lowered to 0°C at the rate of 10°C/minute. The peak top of the maximum peak in the crystallization exothermic curve obtained during this course was regarded as the crystallization temperature. After holding at 0°C for 3 minutes, the temperature was raised at the rate of 10°C/minute to obtain a fusion endothermic curve, in which the peak top of the maximum peak was regarded as the melting point.

(5) Boiling Ether Extraction

Soxlet extractor was used under the conditions specified below.
Extraction sample: 5 to 6 g

〔第三発明〕

まず、本発明の重合体の樹脂特性及び物性の評価方法について説明する。

(1) $[\eta]$ の測定

第一発明において述べたのと同じ方法により行なった。

(2) ペンタッド分率および異常挿入分率の測定

第二発明において述べたのと同じ方法により行なった。

(3) 共重合体中のコモノマー単位の含有量 (モル%)

第二発明において述べたのと同じ方法により行なった。

(4) 分子量分布 (M_w/M_n) の測定

第一発明において述べたのと同じ方法により行なった。

(5) DSC測定

第二発明において述べたのと同じ方法により行なった。

(6) 昇温分別クロマトグラフ

第一発明において述べたのと同じ方法により行なった。

(7) ヘキサンに溶出する成分量 (H 2 5)

第二発明において述べたのと同じ方法により行なった。

(8) 沸騰ジェチルエーテル抽出量の測定

第一発明において述べたのと同じ方法により行なった。

(9) 溶融粘弾性の周波数分散測定

(η^*) ($\text{Pa} \cdot \text{s}$) は、レオメトリクス社 (製) の回転型レオメーター (ARE S) において平行プレート (直径 25 mm, ギャブ 1 mm) を用い、温度 230℃、初期ひずみ 20% 以下の条件にて行った。

(10) 引張弾性率

第二発明において述べたのと同じ方法により行なった。

[Third Invention]

First, a method for evaluating the resin characteristics and the physical characteristics of a polymer according to the invention are described below.

(1) Measurement of $[\eta]$

Measurement was made by the same method as that described in the first invention.

(2) Measurement of % Pentad and % Abnormal Insertion

Measurement was made by the same method as that described in the second invention.

(3) Comonomer Unit Content (% by mole) in Copolymer)

Measurement was made by the same method as that described in the second invention.

(4) Measurement of Molecular Weight Distribution (M_w/M_n)

Measurement was made by the same method as that described in the first invention.

(5) Measurement of DSC

Measurement was made by the same method as that described in the second invention.

(6) Temperature-raising Fractional Chromatography

Measurement was made by the same method as that described in the first invention.

(7) Amount of Components dissolved out into Hexane (H25)

Measurement was made by the same method as that described in the second invention.

(8) Measurement of Amount of Boiling Diethylether Extract

Measurement was made by the same method as that described in the first invention.

(9) Frequency Distribution Determination of Melt Viscoelasticity

A $(\eta^*)(\text{Pa}\cdot\text{s})$ was performed with a rotary rheometer (ARES) manufactured by RHEOMETRIX using a parallel plate (25 mm in diameter, 1 mm in gap) at a temperature of 230°C and at the initial strain of 20% or less.

(10) Tensile Elastic Modulus

Measurement was made by the same method as that described in the second invention.